

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1           **Claim 1 (original):** A method of compressing vector  
2        data which indicate position information on a digital map  
3        and which have a shape represented by a coordinate point  
4        series, the method being characterized by comprising the  
5        steps of:

6                  resampling a vector shape by a constant resampling  
7        length in such a manner that a distance error between a  
8        straight line which links between sampling points and the  
9        vector shape does not deviate to either the left or the  
10      right of the straight line in a longitudinal direction  
11      thereof so as to set a sampling point;

12                representing the vector shape by a data string of  
13        angle information indicating the position of the sampling  
14        point; and

15                variable length coding data of the data string.

1           **Claim 2 (original):** The method of compressing vector  
2        data according to Claim 1, characterized in that:

3                  when setting the sampling point, the sampling point is  
4        set in consideration of a difference between an area  
5        located between the straight line and the vector shape on

6       the right side of the straight line and an area located  
7       between the straight line and the vector shape on the left  
8       side of the straight line.

1           **Claim 3 (original):** The method of compressing vector  
2       data according to Claim 1, characterized in that:

3           when setting the sampling point, the sampling point is  
4       set in consideration of a difference between the length of  
5       a line segment of the vector shape located on the right  
6       side of the straight line and the length of a line segment  
7       of the vector shape located on the left side of the  
8       straight line.

1           **Claim 4 (original):** The method of compressing vector  
2       data according to Claim 1, characterized in that:

3           when setting the sampling point, the sampling point is  
4       set in consideration of a difference between a maximum  
5       distance error between the straight line and the vector  
6       shape on the right side of the straight line and a maximum  
7       distance error between the straight line and the vector  
8       shape on the left side of the straight line.

1           **Claim 5 (original):** The method of compressing vector  
2       data according to Claim 1, characterized in that:

3           when setting the sampling point, the sampling point is  
4       set in consideration of a larger maximum distance error out

5       of a maximum distance error between the straight line and  
6       the vector shape on the right side of the straight line and  
7       a maximum distance error between the straight line and the  
8       vector shape on the left side of the straight line.

1           **Claim 6 (original):** The method of compressing vector  
2       data according to Claim 1, characterized in that:

3               when setting the sampling point, the sampling point is  
4       set in consideration of a deviation angle absolute value of  
5       the straight line.

1           **Claim 7 (original):** An information providing  
2       apparatus for providing data containing position  
3       information on a digital map, being characterized by  
4       comprising:

5               shape data extracting means for extracting road shape  
6       data of an object road from a digital map database;

7               shape data resample processing means for resampling  
8       the road shape data by a constant resampling length in such  
9       a manner that a distance error between a straight line  
10      which links between sampling points and the road shape data  
11      does not deviate to either the left or the right of the  
12      straight line so as to set a sampling point and  
13      representing the object road by a data string of quantized  
14      angle information which indicates the position of the  
15      sampling point;

16           variable length coding means for variable length  
17        coding data of the data string; and  
18           providing means for providing means for providing data  
19        coded by the variable length coding means.

1           **Claim 8 (original):** A probe car on-board apparatus  
2        for providing information on a traveling path, being  
3        characterized by comprising:

4           own vehicle position detecting means for detecting a  
5        position of an own vehicle;

6           storing means for storing sequentially the positions  
7        of the own vehicle detected by the own vehicle position  
8        detecting means as a traveling path;

9           shape data resample processing means for resampling  
10       the traveling path by a constant resampling length in such  
11       a manner that a distance error between a straight line  
12       which links between sampling points and the traveling path  
13       does not deviate to either the left or the right of the  
14       straight line so as to set a sampling point and  
15       representing the traveling path by a data string of  
16       quantized angle information which indicates the position of  
17       the sampling point;

18           variable length coding means for variable length  
19        coding data of the data string; and

20           transmitting means for transmitting data coded by the  
21        variable length coding means.

1           **Claim 9 (original):** A method of compressing position  
2       information on a digital map, being characterized by  
3       comprising the steps of:

4           changing an angle resolution which constitutes a  
5       quantization unit of an angle depending on a length of a  
6       resampling length which regulates an interval of  
7       resampling;

8           dividing a linear shape contained in a digital map  
9       into one or a plurality of segments and resampling linear  
10      shapes in the segments by a constant resampling length;

11          representing the position of the linear shape by a  
12       data string of quantized angle information indicating the  
13       position of a sampling point; and

14          variable length coding data of the data string.

1           **Claim 10 (original):** A compressing method as set  
2       forth in Claim 9, characterized in that:

3           when setting the angle resolution, the magnitude of  
4       the angle resolution is set large when the resampling  
5       length is short.

1           **Claim 11 (original):** The compressing method according  
2       to Claim 9, characterized in that:

3           when setting the angle resolution, the resampling  
4       length or the angle resolution is set such that a distance

5       error between the linear shape and a resampling shape does  
6       not exceed a permissible error that has been regulated in  
7       advance.

1           **Claim 12 (currently amended):** The compressing method  
2       according to Claim 10~~or 11~~, characterized by comprising  
3       further the step of:  
4           setting an upper limit on the angle resolution.

1           **Claim 13 (currently amended):** The compressing method  
2       according to ~~any of Claims 9 to 12~~Claim 9, characterized in  
3       that:

4           when setting the angle resolution, the magnitude of  
5       the angle resolution is changed according to the magnitude  
6       of an absolute value of a deviation angle, so that the  
7       angle resolution when the absolute value of the deviation  
8       angle is small is set small.

1           **Claim 14 (original):** The compressing method according  
2       to Claim 9, characterized in that:

3           when resampling the linear shape,

4           a plurality of candidate points are set at positions  
5       which are away by the resampling length from a adjacent  
6       sampling point in respective directions that the quantized  
7       angle can take; and

8           of the candidate points, the candidate point which

9       approximates to the linear shape most truly is set as a  
10      sampling point.

1           **Claim 15 (original):** An information providing  
2      apparatus for providing position information on a digital  
3      map, being characterized by comprising:

4           angle resolution determination means for setting an  
5      angle resolution which constitutes a quantization unit of  
6      an angle according to a length of a resampling length which  
7      regulates an interval of resampling;

8           shape data resampling processing means for dividing  
9      the road shape of an object road contained in a digital map  
10     into one or a plurality of segments, resampling road shapes  
11     in the segments using a constant resampling length and an  
12     angle resolution set according to the length of the  
13     resampling length and producing a data string of quantized  
14     angle information indicating a position of a sampling  
15     point; and

16           variable length coding means for variable length  
17     coding data of the data string; and characterized in that,

18           data coded by the variable length coding means are  
19     provided as position information of the object road.

1           **Claim 16 (original):** A probe car on-board apparatus  
2      for providing information on a traveling path, being  
3      characterized by comprising:

4            own vehicle position determination means for detecting  
5        a position of an own vehicle;  
6            storing means for storing a traveling path;  
7            resampling length and angle resolution determination  
8        means for determining a resampling length which regulates  
9        an interval of resampling based on the shape of the  
10      traveling path or information of a sensor installed in a  
11      vehicle and determining an angle resolution which  
12      constitutes a quantization unit of an angle according to  
13      the length of the resampling length;  
14            traveling path resample processing means for  
15        resampling the traveling path using the resampling length  
16        and the angle resolution which are determined by the  
17        resampling length and angle resolution determination means  
18        and producing a data string of quantized angle information  
19        indicating the position of a sampling point; and  
20            a variable length coding means for variable length  
21        coding data of the data string, and characterized in that;  
22            data coded by the variable length coding means are  
23        provided as information on the traveling path.

1            **Claim 17 (currently amended):** A computer readable  
2        recording medium storing a program for executing the  
3        compression of vector data indicating position information  
4        on a digital map, being characterized in that:  
5            a computer is made to execute;

6           resampling a vector shape by a constant resampling  
7       length in such a manner that a distance error between a  
8       straight line which links between sampling points and the  
9       vector shape does not deviate to either the left or the  
10      right of the straight line in a longitudinal direction  
11     thereof so as to set a sampling point;

12       representing the vector shape by a data string of  
13       angle information indicating the position of the sampling  
14       point; and

15       variable length coding data of the data string.

1           **Claim 18 (currently amended):** A computer readable  
2       recording medium storing a program for executing the  
3       compression of position information on a digital map, being  
4       characterized in that:

5           a computer is made to execute;

6       setting an angle resolution which constitutes a  
7       quantization unit of an angle according to a resampling  
8       length which regulates an interval of resampling;

9       dividing a linear shape contained in a digital map  
10      into one or a plurality of segments and resampling linear  
11      shapes in the segments by a constant resampling length;

12       representing the position of the linear shape by a  
13       data string of quantized angle information indicating the  
14       position of a sampling point; and

15       variable length coding data of the data string.

1           **Claim 19 (original):** A method of compressing position  
2       information on a digital map, being characterized by  
3       comprising the steps of:

4           resampling an object road segment by a constant  
5       resampling length in such a manner that a distance error  
6       between a straight line which links between sampling points  
7       in the object road segment and the object road segment does  
8       not deviate to either the left or the right of the straight  
9       line in a longitudinal direction thereof so as to set a  
10      sampling point;

11           representing the object road segment by a data string  
12       of angle information indicating the position of the  
13       sampling point; and

14           variable length coding data of the data string.

1           **Claim 20 (original):** A method for compressing  
2       position information on a digital map, being characterized  
3       by comprising the steps of:

4           setting an angle resolution which constitutes a  
5       quantization unit of an angle according to the length of a  
6       resampling length which regulates an interval of  
7       resampling;

8           dividing a road contained in a digital map into one or  
9       a plurality of segments and resampling the segments by a  
10      constant resampling length;

11           representing the position of the segments by a data  
12       string of quantized angle information indicating the  
13       position of a sampling point; and  
14       variable length coding data of the data string.

1           **Claim 21 (new):** The compressing method according to  
2       Claim 11, characterized by comprising further the step of:  
3       setting an upper limit on the angle resolution.